



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,783	02/23/2004	Ju-Bum Lee	SEC.1081	5507
20987	7590	05/17/2005	EXAMINER	
VOLENTINE FRANCOS, & WHITT PLLC ONE FREEDOM SQUARE 11951 FREEDOM DRIVE SUITE 1260 RESTON, VA 20190			MAI, ANH D	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/782,783

Applicant(s)

LEE, JU-BUM

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 4 and 6-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5 and 6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group , claims 1-6 in the reply filed on March 17, 2005 is acknowledged. The traversal is on the ground(s) that the two species are not mutually exclusive from each other. This is not found persuasive because the scope of these claims are differed from each other.

The Applicant further states: claim reads on the embodiment of Figs. 5A-F.

However, the restriction will be withdrawn only if the Applicant admits on record that the species are obvious variants and provide evidence for such admission.

The requirement is still deemed proper and is therefore made FINAL.

2. Claim 4 is directed to an invention that is independent or distinct from the elected species as shown in Figs. 3, for the following reasons:

The limitations of claim 4 includes: forming the second structures ...by etching the etch stop film using the photoresist pattern as etch mask. However, in elected species 1, Fig. 3E, the second structure is formed by etching the etch stop using the hard mask patterns 369.

Accordingly, claim 4 has been withdrawn from consideration as being directed to a non-elected species.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

METHOD FOR MANUFACTURING VIAS BETWEEN CONDUCTIVE PATTERNS
UTILIZING SECOND STRUCTURES FORMED ON THE CONDUCTIVE PATTERNS.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3, lines 7-8, recites: “exposing second regions having dimensions smaller than a critical dimension of the semiconductor device...”.

It is not known which elements of claim 1 constitute semiconductor device .

Since the semiconductor device is undefined, claim 3 is indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

Art Unit: 2814

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1- are rejected under 35 U.S.C. 103(a) as being unpatentable over Horio (U.S. Patent No. 6,368,957) (AAPA) in view of Abbott et al (U.S. Patent No. 6,723,597).

With respect to claim 1, Horio teaches a method for manufacturing a semiconductor device substantially as claimed including:

forming first spacers (X06) on sidewalls of first structures (X04), wherein the first structures include conductive pattern layers (X04) and insulation pattern layers (X02) stacked on a semiconductor substrate (X00), wherein a thickness of each of the insulation pattern layers (X02) is at least four times thinner than a thickness of each of the conductive pattern layers (X04);

forming a first insulation film (X10) to cover the first structures including the first spacers (X06) and regions between the first structures;

forming first insulation film pattern layers located in the regions between the first structures by planarizing the first insulation film (X10);

forming second structures (X16) on the first insulation film patterns and on the first structures, wherein the second structures (X16) expose first portions of the first insulation film patterns, wherein the first portions are spaced from the first structures by a distance which is about 5 to about 35 percent of an interval distance between the first structures; and

Art Unit: 2814

forming openings (X18) in the first insulation film (X10) which expose portions of the semiconductor substrate (X00) by etching the first portions of the first insulation film patterns using the second structures (X16) and the first spacers as an etching mask. (See Figs. 1-15).

Thus, Horio is shown to teach all the features of the claim with the exception of planarizing the first insulation film (X210) until upper faces of the first structures are exposed.

However, Abbott teaches forming first insulation film pattern layers (50) located in the regions between the first structures (34) by planarizing the first insulation film (50) until upper faces of the first structures (34) are exposed. (See Figs. 2A-B).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to planarize the insulation film of Horio to expose the upper faces of the first structures as taught by Abbott to reduce the occurrence of soft errors.

Regarding the first portions are spaced from the first structures by a distance which is about 5 to about 35 percent of an interval distance between the first structures, the distance between the first portion and the first structures of Horio seems to be within the claimed range.

With respect to claim 2, the formation of the second structures of Horio includes:

forming an etch stop (112) film on the first insulation film patterns and on the first structure;

forming etch stop film patterns which expose portions of the first insulation film patterns by etching the etch stop film (112);

Art Unit: 2814

uniformly forming a spacer film (X14') on the etch stop film patterns (X12) and on the exposed portions of the first insulation film patterns; (see Fig. 2); and

forming second spacers (X14) on sidewalls of the etch stop film patterns (X12) by anisotropically etching the spacer film (X14') so that the second structures (X16) including the etch stop film patterns (X12) and the second spacers (X14) are formed, wherein the second spacers are separated from the first structures by a distance which is about 5 to about 35 percent of an interval distance between the first structures. (See Fig. 3).

With respect to claim 5, forming the openings (X18) of Horio is performed using an etching process in which each first insulation film pattern (X10) has an etching selectivity of more than about 10:1 relative to each second structure (X16) and each first spacer (X06).

Although Horio does not explicitly disclosing the selectivity between the materials (X10, X16), however, it is well known in the art that the etch rate of oxide is much higher than that of polysilicon in a plasma oxide etch such as the etching of the opening (X18).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to etch the opening of Horio at an etch selectivity of better than 10:1 to ensure that the diameter of the opening upper portion does not increase.

With respect to claim 6, each second structures (112) of Horio is obviously has a thickness which is less than that of the first structures.

Probable Allowable Subject Matter

6. Claim 3 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.
7. The following is a statement of reasons for the indication of probable allowable subject matter: *removing the hard mask patterns and the second spacers* subsequent to the formation of the second structures which extend from the first structures by a distance of about 5 to about 35 percent of the intervals between the first structures by etching the etch stop film exposed through the second regions using the hard mask patterns and the second spacers as etching masks.

Conclusion

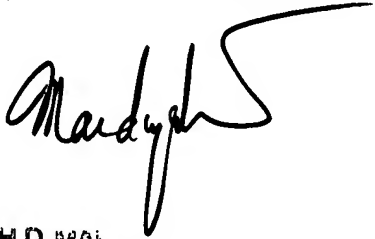
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

Art Unit: 2814

system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Anh D. Mai', with a long, sweeping horizontal stroke extending to the right.

ANH D. MAI
PRIMARY EXAMINER

May 13, 2005